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CENSUS CITIES EXPERIMENT IN URBAN CHANGE DETECTION

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1 January 1973

Type II Progress Report for Period 1 July 1972 - 31 December 1972

Prepared for:

Goddard Space Flight Center
Greenbelt, Maryland 20771

Publication authorized by the Director, U.S. Geological Survey

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Census Cities Experiment in Urban Change Detection (SR-273)		5. Report Date 1 Jan. 1973 6. Performing Organization Code
7. Author(s) James R. Wray (IN-084)		8. Performing Organization Report No.
9. Performing Organization Name and Address U.S. Geological Survey Geographic Applications Program 1717 H Street, N.W., Room 837 Washington, D.C. 20242		10. Work Unit No. 11. Contract or Grant No. S-70243-AG
12. Sponsoring Agency Name and Address Mr. Arthur Fihelly (Code 430) Goddard Space Flight Center Greenbelt, Maryland 20771		13. Type of Report and Period Covered Type II Progress Report 1 July 72 - 31 Dec. 72 14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract This report summarizes the progress and related aspects of ERTS Proposal 273 during the period between 1 July 1972 and 31 December 1972. Some of the more significant items are listed below.

Some coverage over test sites for which imagery is available is still not being sent nor are all data products requested for those sites for which imagery has been received.

1972 ERTS underflight photography continues to be acquired and analyzed. Work continues on mapping of 1970 urban land use from 1970 census contemporaneous aircraft photography. In addition change detection analysis from 1972 aircraft photography is underway for several urban test sites. Land use maps, mosaics, and census overlays for the two largest urban test sites are nearing publication readiness.

Preliminary examinations of ERTS-1 imagery of San Francisco Bay have been conducted which show that tracts of land of more than 10 acres in size which are undergoing development in an urban setting can be identified. In addition, each spectral band is being evaluated as to its utility for urban analyses. It has been found that MSS infrared band 7 helps to differentiate intra-urban land use details not found in other MSS bands or in the RBV coverage in the same scene.

Discussions with LARS at Purdue and CAC at the University of Illinois have been conducted concerning use of NASA Ames ILLIAC IV computer for analysis of ERTS MSS imagery. We have provided them with one set of four CCT's of ERTS MSS frame 1003-18175 for San Francisco Bay in demonstrating this computer capability.

Good quality false CIR composites have been generated from 9 x 9 inch positive MSS bands using the Diazo process.

17. Key Words Suggested by Author	18. Distribution Statement
URBAN LAND USE CHANGE DETECTION CENSUS	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Not applicable	8	

Figure 2A. Technical Report Standard Title Page. This page provides the data elements required by DoD Form DD-1473, HEW Form OE-6000 (ERIC), and similar forms.

Type II Progress Report

ERTS-I

1 July 1972 - 31 December 1972

a. TITLE: Census Cities Experiment in Urban Change Detection. (ERTS-A Proposal No.: SR-273)

b. GSFC ID No.: IN-084

c. Statement and explanation of impedance:

Imagery has been received for only a few of the test sites for which data was requested, while available imagery for other mandatory and desirable test sites has not been received. In addition, we continue to receive large quantities of imagery for areas not part of any specified test sites. This problem (due to programming errors for data requirements in the computer system at NDPF) has been brought to the attention of the NDPF user service and we assume that corrections have been made in the computer listing of our data requirements. All missing coverage has been backordered. However, we still lack coverage over several test sites for which imagery does exist.

Only two of the three black-and-white data products requested are being shipped for those test sites for which we have received imagery, namely MSS 9" X 9" positive transparencies (all bands) and 70 mm negatives (all bands). We have not received the 70 mm positive film chips for any of the test areas thus preventing the application of additive color enhancement techniques for analytical purposes. Also, the 70 mm negatives which are being sent are very dense, resulting in poor quality positive reproductions.

In addition, the work statement of ERTS Experiment 273 (GSFC ID No. IN-084) is still on record as that appearing in the Memorandum of Understanding between NASA and USGS which is based on the initial proposal but which was subsequently revised. The revised work statement omits certain tasks in keeping with the reduced budget and suggested time frame. An ammendment of the new work statement is in preparation.

d. Accomplishments during the reporting period and those planned for the next period:

Pursue acquisition of reproduction of 1972 aircraft ERTS underflight photography which has already been flown, plus acquisition of aircraft ERTS underflight photography for additional urban test sites. This photography is essential for the change detection aspect of the experiment as well as for the evaluation of the ERTS imagery itself. Meanwhile, analyses of 1970 urban land use from 1970 census contemporaneous aircraft photography continues to progress. Land use maps, mosaics, and census overlays for the two largest urban test sites are nearing publication readiness. Change detection analyses from 1972 aircraft photography has been completed for Cedar Rapids and is well underway for Washington and San Francisco.

e. Scientific results and practical applications (Category 2E):

Oral and written presentations listed under (f) include mention of likely applications of comparative urban area analyses using remote sensors aboard aircraft. Some applications and preliminary evaluations of ERTS imagery are also listed. Preliminary examinations of

ERTS-1 imagery in the San Francisco Bay area clearly indicate a real potential for identifying and measuring the urban fringe. The infrared band helps to differentiate intra-urban land use details not found in other MSS bands or in the RBV coverage in the same scene. It also has been demonstrated that tracts of more than about 10 acres in size that are undergoing development in an urban setting (San Francisco) can be identified.

Wray discussed with representatives of the Laboratory for Applications of Remote Sensing at Purdue University and the Center for Advanced Computation, University of Illinois (December 7 and 8) use of one set of four CCT's of ERTS MSS frame 1003-18175 for San Francisco Bay in demonstrating the NASA Ames ILLIAC IV system for analyzing ERTS MSS imagery. This was in response to a proposal submitted by CAC/LARS concerning analysis of MSS tapes by the ILLIAC IV computer using a representative EROS ERTS experiment for which suitable ground truth and tapes are available.

Experiment with color enhancement of ERTS imagery has been undertaken using a diazo process to generate false CIR composites from the 9" X 9" black-and-white MSS bands. TECHNIFAX Diazochrome color transparency products in yellow, magenta, and cyan (subtractive primary colors of bands 4,5, and 7) were combined with bands 4,5, and 7, respectively and each exposed to an ultraviolet light source (provided by an Ozalid machine in USGS photo lab) and then developed in ammonia vapor. By combining and registering each color transparency, a false CIR com-

posite can be rendered which is of very good quality and which greatly enhances the interpretability of the ERTS imagery. The cost of producing this complete color composite is about 30 cents. Quality of reproduction, however, is dependent on the density of the original continuous tone film positive.

f. Published reports or talks:

"The Census Cities Project: A Status Report for 1971," James R. Wray, Fourth Annual Earth Resources Program Review, V. III, pp. 73-76, 77, NASA MSC, Houston, Texas, January 17-21, 1972.

"Cartographic Aspects of an Operational System for Detecting Urban Change by Remote Sensing," James R. Wray, Sixth International Cartographic Association Conference, Technical Session on Urban Cartography, Ottawa, Canada.

"A Remote Sensing System for Monitoring Land Use Change in a Metropolitan Region," James R. Wray, presented at meeting of American Society of Mechanical Engineers, Anaheim, California, September 12-13, 1972.

"A Preliminary Appraisal of ERTS-1 Imagery for the Comparative Study of Metropolitan Regions," James R. Wray, NASA Goddard SFC, Greenbelt, Maryland, September 29, 1972.

"An Evaluation of the Pre-ERTS Simulation Imagery for Detection of Metropolitan Land Use Change," James R. Wray, University of Michigan, Institute of Science and Technology, Eighth Symposuim on Remote Sensing of the Environment, Ann Arbor, Michigan, October 2-6, 1972.

"The Use of Small-Scale Photography for Detecting Land Use Change," Valerie A. Milazzo and Harry F. Lins, Jr., presented at University of Michigan Eighth Symposuim on Remote Sensing of the Environment, Ann Arbor, Michigan, October 2-6, 1972 and ACSM/ASP Fall Technical Convention, Columbus, Ohio, October 11-13, 1972.

In addition, Wray participated in the News Media ERTS Briefing held at NASA Headquarters on July 12. Three USGS staff members, James Wray, Richard Ellefsen, and Duilio Peruzzi, reported on aspects of the Census Cities Analysis of the San Francisco test site at the 22nd International Geographical Congress, Section XIII, Remote Sensing, Montreal, Canada, August 12, 1972.

Wray also participated in the EROS sponsored training course for Interior Department personnel at the EROS Sioux Falls Data Center, Sioux Falls, South Dakota, November 1-7, 1972.

g. Recommendations for improvement:

Recommend (1) collateral research in automatic pattern recognition of urban land use and land use change; (2) preparation of procedural manual for producing comparative urban analyses from high altitude photography, and (3) development of urban spatial growth model from comparative urban land use studies produced by this experiment. Proposals for these efforts have been submitted to, and accepted for funding by, the EROS Program Manager.

h. Changes in standing order forms:

A change in the MSS bulk-processed products requested was affected during the last reporting period. Our standing order for each test site now consists of 70 mm negative transparencies (1 each band), 70 mm positive transparencies (2 each band), 9 x 9 inch B-W positive transparencies (2 each band), and 9 x 9 inch color composite transparencies (1 composite).

i. ERTS Image Descriptor Forms:

We have not received any Image Descriptor Forms with our ERTS imagery shipments. Therefore we have not filed any. However, we intend to complete a select number of forms for descriptors of urban features appropriate to the concerns of the experiment.

j. Change in data request forms:

We have submitted one request for additional data, this being for one set of four computer compatible tapes of ERTS MSS images for frame 1003-18175, San Francisco Bay, 26 July 1972. We also submitted a request for RBV and MSS frames acquired prior to August 1, 1972.